

INNOVATIONS IN SUBSTANCE ABUSE TESTING

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The 2 Steps to the 12 Steps: How to Determine if a Parent is a Druggie, a Drunk or Just Dry; Co-Authors Christy Bradshaw Schmidt and Diana S. Friedman; UT School of Law, 2010 Parent-Child Relationships: Critical Thinking for Critical Issues; January 2010

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INTRODUCTION

In a family law case, it is common for one party to accuse the opposing party of substance abuse. As a result, drug and alcohol testing has become a commonplace tool used to determine the accuracy of substance abuse allegations and issues related to custody and visitation. When used properly, drug and alcohol testing is a valuable tool. Armed with the proper information, drug and alcohol testing can then be used to provide evidence of use and non-compliance with the court orders or abstinence and compliance with court orders. Unfortunately, Judges and attorneys are often uninformed regarding the technical nuances of the various testing methods and myths which results in drug and alcohol testing that is inappropriate to the specific circumstances of the case.

The objectives of this paper are to provide the reader with information regarding technical applications and limitations of the various drug and alcohol testing methods. It will explain the myths and truths about drug and alcohol testing including the products used, or attempted to use, with the intent to falsify or negate a test result or to cleanse his or her system of all toxins.

All tests referenced in this paper are forensic tests therefore HIPAA regulations do not apply. Forensic means we are looking for the evidence of the drug and drug metabolites in the specimen to be tested. HIPAA regulations apply to medical or monitored drug tests. The one exception that HIPAA may apply is when using a razor blade (a medical device) to scrape the nails to collect the sample. This is discussed again under nail testing.

COMMONLY ABUSED DRUGS

Alcohol: Alcohol, while a legal drug, is often abused and habitual use can lead to addiction and significant physical and psychological health problems. Alcohol is rapidly metabolized by the liver into its principle chemical components including carbon dioxide and sugars. Alcohol is within the family of depressant drugs with symptoms including slurred speech, loss of motor coordination and impaired judgment. Alcohol is consumed primarily for its psychotic effects which include a loss of inhibitions and euphoria.

Amphetamine: (AMP) Amphetamines are central nervous stimulants whose effects include alertness, wakefulness, increased energy, reduced hunger and an overall feeling of well being. Large doses and long term usage can result in higher tolerance levels and dependence. The most common source for amphetamine is the prescription diet pills.

Barbiturates: (BAR) Classified generally as depressants, barbiturates produce a state of intoxication that is remarkably similar to alcohol intoxication. Symptoms include slurred speech, loss of motor coordination and impaired judgment. Depending on the dose, frequency, and duration of use, one can rapidly develop tolerance, physical dependence and psychological dependence on barbiturates. Barbiturate abusers prefer the short-acting and intermediate-acting barbiturates pentobarbital (Nembutal), secobarbital (Seconal) and amobarbital (Amytal). Other short- and intermediate-acting barbiturates are butalbital (Fiorinal, Fioricet), butabarbital (Butisol), talbutal (Lotusate) and aprobarbital (Alurate). After oral administration, the onset of action is from 15 to 40 minutes and the effects last up to 6 hours.

Benzodiazepines: (BZO) Also classified as depressants, benzodiazepines are used therapeutically to produce sedation, induce sleep, relieve anxiety and muscle spasms and to prevent seizures. In general, benzodiazepines act as hypnotics in high doses, as anxiolytics in moderate doses and as sedatives in low doses. Like the barbiturates, benzodiazepines differ from one another in how fast they take effect and how

long the effects last. Shorter acting benzodiazepines, used to manage insomnia, include estazolam (ProSom), flurazepam (Dalmane), quazepam (Doral), temazepam (Restoril) and triazolam (Halcion). Benzodiazepines with longer durations of action include alprazolam (Xanax), chlordiazepoxide (Librium), clorazepate (Tranxene), diazepam (Valium), halazepam (Paxipam), lorazepam (Ativan), oxazepam (Serax) and prazepam (Centrax). Abuse of Benzodiazepines occurs primarily because of the "high" which replicates alcohol intoxication. Approximately 50 percent of people entering treatment for narcotic or cocaine addiction also report abusing benzodiazepines.

Cocaine: (COC) Cocaine is made from coca leaves. Its effects include alertness, wakefulness, increased energy and an overall feeling of euphoria. Cocaine may be smoked, inhaled ("snorted") or injected. Cocaine can be a very addictive drug.

Ecstasy: Methylenedioxymethamphetamine (MDMA) is a designer drug first synthesized in 1913 by a German drug company for the treatment of obesity. Those who take the drug frequently report adverse effects, such as increased muscle tension and sweating. MDMA is not clearly a stimulant, although it has, in common with amphetamine drugs, a capacity to increase blood pressure and heart rate. MDMA does produce some perceptual changes in the form of increased sensitivity to light, difficulty in focusing, and blurred vision in some users. Its mechanism of action is thought to be via release of the neurotransmitter serotonin. MDMA may also release dopamine, although the general opinion is that this is a secondary effect of the drug. The most pervasive effect of MDMA, occurring in almost all people who have taken a reasonable dose of the drug, is to produce a clenching of the jaws. Symptomatic and biological responses to MDMA are similar to those produced by methamphetamine.

A new version of Ecstasy, called "Extreme Drug" and laced with methamphetamine, is entering the US through the northern states from illegal labs in Canada. Canadian ecstasy laboratories are producing more than 2 million tablets per week.

Methadone: (MTD) Although chemically unlike morphine or heroin, methadone produces many of the same effects. Methadone is primarily used today for the treatment of narcotic addiction. It is also used as a mild pain reliever. The effects of methadone are longer-lasting than those of morphine-based drugs. Methadone's effects can last up to 24 hours, thereby permitting administration only once a day in heroin detoxification and maintenance programs. Ironically, methadone, used to control narcotic addiction, is a frequently abused narcotic, often encountered on the illicit market and methadone has been associated with a number of overdose deaths.

Methamphetamine: (MET or M-AMP) Methamphetamine is a stimulant drug. It is used in pill form or in powdered form by snorting or injecting. Crystallized methamphetamine is inhaled by smoking and is a considerably more powerful form of the drug. Some of the effects of methamphetamine use include: increased heart rate, wakefulness, physical activity and decreased appetite. Methamphetamine use can cause irreversible damage to the brain, producing strokes and convulsions, which can lead to death. Ecstasy, a new trendy and popular drug among teenagers is a refined and processed form of methamphetamine.

Opiates: (OPI) Opiates are any of the addictive narcotic drugs derived from the resin of the poppy plant. Opiates are analgesics (pain reducers) which work by depressing the central nervous system. They can also depress the respiratory system. Doctors often prescribe them for severe or chronic pain. Opiates are very addictive, both physically and psychologically. Used for only a short time normally results in addiction. Some commonly used opiates are: Codeine, Heroin, Methadone, Morphine, Opium, Percodan, Talwin, Dilaudid, Hydrocodone and Demerol. Opiates are commonly referred to as "downers". Opiates can appear in many forms: white powder or crystals; small white, yellow or orange pills; large colorful capsules; clear liquid and dark brown, sticky bars or balls. Heroin accounts for the majority of the illicit opiate abuse. Some physical indications of opiate use include: extreme loss of appetite and weight, needle tracks or

punctures, black and blue marks from "skin popping", scars along veins, cramps, nausea, vomiting, excessive scratching and complaint of itching, excessive sweating, constipation, raw, red nostrils from snorting, runny nose, pin-point pupils and watery eyes, reduced vision, drowsiness, euphoria, trance-like states, excessive thirst, tremors, twitching, unkempt appearance, strong body odor, irritability, chills; slight hallucinations and lethargy. Opiates reduce attention span, sensory and motor abilities, produce irrational behavior, depression, paranoia, and other psychological abnormalities.

Oxycodone (OXY) Pharmaceutical drugs Percodan, Percocet, Roxicodone, Oxycontin. While classified as an Opiate, the chemical structure and metabolite of Oxycodone requires a separate Opiate test with a substantially higher sensitivity detection level than that of the standard Opiate drug test. Consequently, a positive test result will not only confirm Oxycodone but other prescribed opiates as well that were listed under Opiates in the previous paragraph. Oxycodone is generally prescribed in oral pill form with the analgesic buffer Acetaminophen. Acetaminophen, 4'-hydroxyacetanilide, is a non-opiate, non-salicylate analgesic and antipyretic which occurs as a white, odorless, crystalline powder, possessing a slightly bitter taste.

Phencyclidine: Phencyclidine hydrochloride (PCP), also known as "angel dust," is a hallucinogen. PCP is commonly taken orally, by inhalation, by snorting or injection. The effects of this drug are unpredictable and variable. Users may exhibit signs of euphoria, anxiety, relaxation, increased strength, time/space distortions, panic or hallucination. PCP use can lead to paranoia and extreme irrational behavior. Once popular, PCP use has declined dramatically in recent years and is no longer considered a major drug of abuse. However, it is still available on the streets and used by certain groups.

Propoxyphene: (PPX) is a narcotic analgesic compound bearing structural similarity to methadone. As an analgesic, propoxyphene can be from 50-75% as potent as oral codeine. Darvon and Darvocet are two of the most common brand names for the drug. Darvocet contains 50-100 mg of propoxyphene napsylate and 325-650 mg of acetaminophen. Peak plasma concentrations of propoxyphene are achieved from 1 to 2 hours post dose. In the case of overdose, propoxyphene blood concentrations can reach significantly higher levels.

Marijuana: Tetrahydrocannabinol (THC) is an active component in marijuana. Marijuana, a hallucinogen, is commonly ingested by smoking, but it may also be eaten. Marijuana Honey Oil and liquid THC is relatively new on the streets. Marijuana may impair learning and coordination abilities. Marijuana is most commonly the drug of choice among teenagers and young adults. The hallucinogenic effect of Marijuana can lead to irrational behavior, disorientation, and paranoia. Marijuana is the most common recreational drug of abuse.

All forms of cannabis have negative physical and mental effects. Several regularly observed physical effects of cannabis are a substantial increase in the heart rate, bloodshot eyes, a dry mouth and throat, and increased appetite.

Use of cannabis may impair or reduce short-term memory and comprehension, alter sense of time, and reduce ability to perform tasks requiring concentration and coordination, such as driving a car. Motivation and cognition may be altered, making the acquisition of new information difficult. Marijuana can also produce paranoia and psychosis.

Because users often inhale the unfiltered smoke deeply and then hold it in their lungs as long as possible, marijuana is damaging to the lungs and pulmonary system. Marijuana smoke contains more cancer-causing agents than tobacco smoke. Long-term users of cannabis may develop psychological dependence and require more of the drug to get the same effect. The marijuana on the streets today is much stronger than it was in the 60s and 70s. It is cultivated to be stronger and more potent every year.

Tricyclic antidepressants, (TCA) Tricyclic antidepressants have been prescribed since the 1950s for depression and compulsive disorders. Until recently TCAs were the primary choice of physicians for the vast majority of people with major depressive disorders. Ironically TCAs are often prescribed for symptomatic treatment of drug addiction and withdrawal and in particular, alcoholism. Tricyclic antidepressants work by raising the levels of serotonin and norepinephrine in the brain by slowing the rate of reuptake, or re-absorption, by nerve cells. Usually TCAs are taken over an extended period as effects from the drugs are gradual. Because of the possibility of causing serious cardiac complications, TCAs can be lethal if misused at high doses. Abuse of TCAs can be the result of fear of relapse rather than any psycho-pharmacological effect however the potential for TCA abuse is well established, since the drugs have clearly defined euphoric psychological and stimulatory physiological action in cases of chronic usage. Generic and brand names of the tricyclic antidepressants include Adapin, Amitriptyline, Amoxapine, Asendin, Desipramine, Doxepin, Elavil, Imipramine, Ludiomil, Maprotiline, Norpramin, Nortriptyline, Pamelor, Pertofrane, Protriptyline, Sinequan, Surmontil, Tofranil, and Vivactil. Any comprehensive drug screening program should include a TCA panel.

Abused drugs have many street names. The following is a list of the most common street names. A comprehensive list can be found by searching the internet with terms such as “drug street slang.”

Amphetamine	Speed, amp, bennies, black beauties, chalk, uppers, hi, speed balls, beans, hiballs, beanie babies, eve
Methamphetamine	Crystal, meth, ice, glass, speed, icebergs, bergs, ecstasy, MDEA
Cocaine	Coke, crack, snow, flake, blow, rock, line, snuff, sugar, snort, stones, nose candy, freebase, toot
Marijuana	Pot, weed, herb, bud, MJ, doobie, reefer, joint, blunts, grass, rope, hemp, roach
Phencyclidine (PCP)	Angel dust, sherms, star dust, magic dust, dust, silver/gold glitters, wack
Opiates (heroin)	Horse, smack, hairy hombre, H, scag, jones, fix
Barbiturates Benzodiazepines	Downers, uppers, highway, lows, reds, barbs, trangs
MDMA	Ecstasy, adam, XTC, X, hug drug, beans, love drug, lover’s speed

DRUG TESTING IN GENERAL

Most drug tests are performed by urine. The second most common is hair followed by nails, saliva and sweat. The three major types of drug tests are explained below.

Urine - Urine testing is the most common and has a broader window of detection than saliva testing. Saliva detection is usually less than 24 hours. Urine can test for the greatest range of detectable drugs. The detection window is a few days to a week. Marijuana is the exception with a detection window up to 40 days for chronic users. It is best used if the person has recently ingested drugs and for random testing.

Hair - Hair testing is non-invasive and used to indicate long term use. It is not a “follicle test” since the follicle is not attached to the hair or the part of the hair that is tested. Hair test accurately describes the test being performed. It takes approximately 150 strands of hair to have sufficient quantity to perform the test not 1 or 2 strands as many believe.

Drugs are captured in the core of the hair as blood passes through the hair follicle. The standard test from head hair covers a 90 day window of drug use. The most recent two weeks is eliminated since

the hair is growing from follicle to above the scalp plus the thickness of the scissors. This represents the first 1 ½ inches of hair cut as close as possible to the scalp. Degradation starts to occur beyond 1 1/2 inches preventing an accurate test, or picture, of what actually occurred regarding drug use. Body hair may be used when head hair is too short or non-existing. The window of detection for body hair can be as long as 12 months but may be much shorter. Body hair grows for 7 to 12 months and then becomes dormant.

Hair testing is accurate but caveats exist. Marijuana is harder to detect than other drugs. Admitted marijuana users occasionally have negative test results. Another explanation for a negative test for marijuana, or any drug, can result from shampoos designed specifically to remove the drug from the core of the hair. Some of these products help reduce the levels, some do not. Even bleaching or coloring the hair has a minor effect of reducing the levels of the drug in the hair.

Nails - Fingernail and toenail testing is relatively new in drug testing. It is being used when the donor shaves his or her head to avoid a hair test or use of shampoos are suspected. The accuracy is the same as hair since both are made of keratin. The window of detection is 3 to 8 months or longer.

Most labs use multiple drug test panels or screens in the initial test. The multi drug screen allows you to run several drugs using one device and one sample. It is important to know before the test is performed what test panel is being administered and what drugs are included in the panel. Drugs tested in one panel may vary greatly based on the testing company, the lab, the expense and the expectations. The following drugs are included in the most common test panels but others may be added if specifically requested:

Amphetamines, Barbiturates, Benzodiazepines, Cocaine, Cannabis (THC), Methadone, Methamphetamines, Opiates, PCP and MDMA (Ecstasy), & Propoxyphene.

There are two primary methods used to screen or test for drugs. The initial screen is Immunoassay and confirmations performed by Gas Chromatography/Mass Spectrometry (GC/MS), Gas Chromatography/Mass Spectrometry/Mass Spectrometry (GC/MS/MS), or Liquid Chromatography/Mass Spectrometry/Mass Spectrometry (LC/MS/MS)

Immunoassay is the most commonly used method to initially screen samples. It is a rapid process that can test many samples per run. It works on the principle of antigen-antibody interaction. Antibodies are chosen which will bind selectively to drugs or their metabolites. The binding is then detected using either enzymes, radioisotopes or fluorescent compounds. Any positive found in the screening process is confirmed by a second method that is not immunoassay.

Confirmation test by GC/MS, GC/MS/MS or LC/MS/MS is used in the event that drugs or their metabolites are detected in the initial screening test. The sample is tested again using one of the more sensitive methodologies for the confirmation test. This is the most precise tests for identifying and quantifying drugs or their metabolites. It involves a two step process, whereby Gas Chromatography separates the sample into its constituent parts and Mass Spectrometry identifies the exact molecular structure of the compounds. The combination of Gas Chromatography/Mass Spectrometry or one of the other confirmation methods is considered to be the definitive method of establishing the presence of drugs or their metabolites.

The Substance Abuse and Mental Health Services Association (SAMHSA) provides guidelines for what qualifies as a positive drug test. If a test does not give results higher than the guidelines or cut-off level, it does not qualify as a "positive" test. If an immunoassay test gives positive results, a second confirmation test must also give positive results before the results are released as positive.

In general, cut-off levels for urinalysis have been established to reduce the possibility of external or incidental exposure such as passive inhalation. A true comparison of hair/urine cut-off levels is impossible, since the time frame differs (90 days vs. 5 days). SAMHSA's recommended cut-off levels for forensic

urinalysis tests are expressed in nanograms per milliliter (ng/ml) of urine. Hair cut-off levels are expressed in picograms per milligram (pg/mg) of hair.

A metabolite is any substance produced or used during metabolism (digestion). In drug use, the term usually refers to the end product that remains after metabolism. In other words, the body changes the parent drug to a metabolite.

When a sample is given for drug testing, it will be tested for the drug itself (parent) and the substances (metabolites) produced by the body when it processes (metabolizes) the drug. The existence of a drug's metabolite confirms that a person ingested the drug. For example, if a drug test showed a positive for benzoylecgonine or norcocaine then the person being tested had ingested cocaine. The presence of the metabolite cocaethylene indicates and proves that the person consumed alcohol at the same time as the cocaine.

Below is a chart of the drug and its metabolite:

PARENT DRUG	METABOLIZES TO
Amphetamine	Amphetamine
Methamphetamine	Amphetamine
Cocaine	Benzoylecgonine, Norcocaine
Marijuana	Carboxy - THC
Hydrocodone	Hydromorphone
Oxycodone	Oxymorphone
Heroin	6-acetylmorphine

Commonly ingested substances such as vitamins, penicillin, aspirin, caffeine and acetaminophen (Tylenol), will not affect the results of a drug test. The tests are drug and drug metabolite specific. Because these commonly ingested substances are chemically and structurally different after being metabolized, they will under most circumstances not interfere with or compromise test results.

There are some prescription and non-prescription medications that will affect a drug test. There are prescriptions that contain the same drugs that are commonly found in street drugs. There is no easy way to distinguish between the two forms of the drug. However, the problem is not as big as it would seem.

There are no prescriptions for PCP. It is extremely rare to find cocaine used in a medical setting, although it happens occasionally, usually during nasal surgery or to control bleeding from the eye or nose. If used, it will be well documented in the person's medical file. Such use would cause the urine to test positive for cocaine metabolite for approximately 6 hours. It would not be sufficient quantity to cause a positive hair test.

It is possible but highly unlikely that poppy seeds will be the cause of a positive morphine or codeine test. Other prescribed opiates may occasionally cause a positive screen but are sorted out in a confirmation test.

There are some prescription diet pills that contain amphetamine or methamphetamine. For example there is a drug for Parkinson's disease that is a form of methamphetamine. Some doctors prescribe amphetamines for ADHD. Ecstasy is included in the amphetamine class of drugs and is specifically identified by the GC/MS confirmation.

When a person submits for a drug test, he or she should provide the collection agency with a list of all prescribed medications unless it is a pre-employment test. There are literally hundreds of brand name and generic drugs being prescribed today.

If you have a question on a specific prescribed medication, you will need to know the general classification of that medication to determine if it will test positive on any of the specific drug test panels, i.e.: opiates, amphetamine, methamphetamine, benzodiazepines, barbiturates etc. For general classifications on prescription drugs you can either ask your pharmacist or go online to <http://www.rxlist.com> and enter the name of the prescription drug to determine its general classification and pharmacology.

Chemically there is no difference between heroin, morphine and codeine. All three of these drugs are derived from opium or the opium chemical structure and are in the Opiate class of drugs. The difference is primarily in the manner in which opium is refined or synthetically manufactured and the form and method of delivery. Heroin quickly metabolized to 6-AM and then to morphine in approximately 8 hours. The probable cause of a morphine positive test is (1) prescribed morphine or (2) heroin use.

Both amphetamine and methamphetamine are potent sympathomimetic agents. Methamphetamine metabolizes (or changes) into amphetamine in the body at approximately a 10 to 1 ratio. A higher level of amphetamine exceeding the 10 to 1 ratio probably indicates the donor is also taking a prescribed amphetamine at the same time as using methamphetamine. There will not be methamphetamine levels on a drug test if the person is taking only a prescribed amphetamine. For example, an amphetamine such as Adderall does not metabolize to methamphetamine.

URINE TESTING

Under the DOT or Federal testing guidelines, drug testing has two cutoff levels for positive detection. That is, labs that follow the guidelines consider drug testing to be negative if detection is below *either* cutoff level. In the case of urine analysis, drug testing cutoff levels are measured in nanograms per milliliter (ng/ml). For example, an initial screening for marijuana must show at least 50 ng/ml, and then confirmatory tests must be at least 15 ng/ml. If the initial screening doesn't show at least 50 ng/ml, then it's considered to be negative and the confirmatory tests aren't performed.

All other testing, such as court ordered testing, is considered Non-Federal or Non-DOT. The screening level for marijuana can be as low as 20 ng/ml to extend the window of detection in a urine test. The lab can also perform a Limit of Detection (LOD) or Limit of Quantitation (LOQ) test using the lowest possible cutoff levels. The LOD or LOQ, such as court testing, should be used only in certain case scenarios to determine if a specific drug has been used.

Screening and confirmation testing are performed using different testing methodologies that precipitate different cut-off levels. The immunoassay tests used to perform initial drug screening are designed to detect a wide range of chemically similar compounds that react with the antibodies which are at the core of the chemistry making up the tests. In contrast, GC/MS confirmatory testing detects specific metabolites that provide identification and quantification of a specific drug.

For example, marijuana has approximately 5 metabolites that the immunoassay will identify. The total nanogram level is the sum of all 5 metabolites. The GC/MS confirmation identifies only one of the 5 metabolites and reports the sum of only that metabolite. The GC/MS quantitation level is reported on the lab report and never the

immunoassay screening level.

Simply put, creatinine is the normal metabolic waste in urine. It is the primary means to determine if a urine sample is diluted resulting in an invalid test. Because the creatinine is excreted from the body at a constant rate, there are expected values for creatinine in normal human urine. Normal creatinine levels in urine are between 100 and 200 mg/dL. The creatinine level in a diluted sample is between 6 and 20 mg/mL. The sample is considered substituted if the creatinine value is 5mg/dL or less meaning the sample is not consistent with human urine. The donor has poured something into the urine such as water. To eliminate this problem, order the donor to provide a witnessed collection. This means a collector of the same gender actually observes the sample going into the collection cup. Also, allow a person only 3 hours from notification to taking a urine test. Exceptions exist but never allow a person to test the next day after notification.

The most common method of sample manipulation to avoid a positive drug screen is dilution. Other forms of sample adulteration are the in-vitro addition of adulterants or additives into the specimen sample to destroy the chemical reaction properties of lateral flow.

The urine specimen may not be valid if the temperature is not within a certain range. The average temperature of a non-witnessed urine sample returned to the collector is 95 to 97 degrees. The temperature of the collection container will drop the temperature of the urine slightly plus the time it takes to return the sample to the collector must also be considered. Any temperature less or greater than this may not be consistent with normal human urine or a substituted sample. A perceptive and properly trained collector will make a decision to reject or accept the sample if the temperature is out of range. A witnessed collection will eliminate the problem with donors attempting to substitute or alter a urine specimen. A second sample is normally requested when the first is rejected for improper temperature or suspicious activity. The above guidelines are not for DOT/Federal drug testing.

Drug testing by urine is designed only to detect whether or not a specific drug or drug metabolite is present at the biological moment the sample is collected. While there are very broad estimates as to how long a particular drug may have been in the system, the drug test is not intended to include a time variable. The following chart illustrates typical drug detection periods.

URINE DRUG DETECTION/CLEARANCE TIMES

Target Drug	Minimum	Maximum
Alcohol (not EtG test)	1 hour/drink	<=6-12 hours
EtG Alcohol	Depends on volume consumed	Up to 3 days, possibly 5 days
Amphetamines	2-7 hours	2-4 days
Anabolic Steroids	4-6 hours	Oral: 2-3 weeks / Injected: 1-3 months (Naldrolene 8 months)
Barbiturates	2-4 hours	Short acting type (Alphenal, Amobarbital, Allobarbital, Butethal, Secobarbital) 1-4 days. Long acting type (Phenobarbital, Barbital) 2-3 weeks or longer
Benzodiazepines	2-7 hours	Infrequent user: 3 days / Chronic user: 4-6 weeks
Cannabinoids (THC-Marijuana)*	6-18 hours	*Infrequent user: up to 10 days / Chronic user:30 days or longer
Cocaine Metabolite	1-4 hours	2-4 days
LSD	2 hours	A few hours
Mescaline	1-2 hours	2-4 days
Methadone	2 hours	2-6 days
Methamphetamines	1-3 hours	2-4 days
Methaqualone	3-8 hours	Up to 10 days
MDMA (ecstasy)	1 hour	2-3 days
Opiates (Heroin, Morphine, Codeine)	2 hours	2-3 days
Oxycodone	1 hour	1-2 days
Phencyclidine (PCP)*	5-7 hours	*Infrequent user: 6- 8 days / Chronic user: 21-28 days+
Propoxyphene	4-6 hours	1-2 days
Psilocybin (Mushrooms)	2 hours	1-3 days
Rohypnol	1 hour	< =8 hours
GHB	1 hour	< =8 hours
Tricyclic Antidepressants (TCA)	8-12 hours	2-7 days

The urine test can only detect whether or not a specific drug or drug metabolite is present at the time the test is performed. Many factors unique to the individual being tested determine the actual half-life of the particular drug including such variables as age, metabolic rate, overall health, body hydration, amount of drug consumed over what period of time, strength of the drug, etc. Therefore, no conclusions can be drawn as to when a particular drug was taken or how much was consumed with these types of drug of abuse tests. Only assumptions can be made.

It was believed until recently that the heavier the person was, the longer it took for marijuana to be eliminated from the body in urine. Not one study has been performed to prove this assumed theory. In actuality, marijuana leaves the body at approximately the same rate regardless of body fat.

In reality or normal conditions found in a car, home or concert, urine concentrations above the cutoff sensitivity level of the test, or a positive result, are not possible by exposure to second hand smoke. This is not a valid claim for any smokable form of drug.

HAIR TESTING

Drugs are incorporated into hair by 3 main routes. First is environmental exposure. If an individual is exposed to drug smoke or particulate matter, the drug will physically transfer the parent drug to the hair and bind to it. Second is from the sweat and oil of the scalp. The sweat and oil from the scalp contain drug and drug metabolites. As these fluids bathe the hair shaft, they deposit the drug onto the hair where it binds and is available for analysis. Third is from the blood. As the blood travels through the follicle, it deposits drug and drug metabolites into the core of the hair.

It takes approximately 4-5 days from the time of drug use for the affected hair to grow above the scalp and for the drug to start to show up in a person's hair. The thickness of the scissors used to cut the hair as close as possible to the scalp is a factor. Adding this to the hair growth rate, the test results will not indicate any drug use in approximately the first two (2) weeks starting with the date the hair was collected. In other words, your window of detection starts two (2) weeks before the hair was collected.

Body hair growth rates are generally slower and cannot be utilized in the same manner as head hair to determine a timeframe of drug use. Body hair grows for 7 to 12 months and then becomes dormant. It falls out and new hair begins to grow. Although the lab report may state approximately 12 month window of detection, it is by no means a 12 month test in all cases.

Once the drug and drug metabolites are incorporated into hair, they begin to slowly leach out due to normal daily hygiene and exposure to the elements. Head hair grows on average at 0.5 inches per month. After approximately 3 months, most drugs have leached out below the level of detection or to a level not representing an accurate indication of drug use. As such, a standard head hair test covers a period of approximately 90 days.

A standard test with GC/MS confirmation requires 60+ milligrams of hair or approximately 90 to 120 strands. The thickness of different types of head hair (thick coarse vs. thinning fine) is one reason for this variation.

The optimum length of head hair is 1.5 inches. The hair sample is cut as close to the scalp as possible and the most recent 1.5 inches are tested. Upon receipt at the laboratory, the root end is identified and the specimen is cut at 1.5 inches, which represents approximately 3 months of growth. The excess length of hair is sealed and remains with the original sample by most labs. 1.5 inches in length and 90 to 120 strands of hair allows for an initial immunoassay test, 2-3 confirmation tests and a small amount left over for a referee lab, if needed, for re-test.

Hair collected from a brush can be used but a timeframe of use cannot be determined. Normally the test results from a brush are not admissible in court.

A reputable lab will always perform a confirmation test of all positive hair results in the initial screen. The confirmation utilizes GC/MS, GC/MS/MS or LC/MS/MS for all specimens that screen positive in the initial test.

The standard hair test is a 5-drug panel test which consists of:

- Cocaine and its metabolites
- Methamphetamine, amphetamine, MDMA (Ecstasy), MDA (Ecstasy metabolite)
- Opiates, morphine, codeine
- Phencyclidine (PCP)
- Marijuana

The following additional drugs can be tested for in the hair:

- Benzodiazepines (diazepam metabolites)
- Barbiturates
- Opiates, (additional prescribed not listed above)
- Methadone and EDDP (metabolite)
- Propoxyphene metabolite
- Oxycodone
- Meperidine
- Tramadol
- Fentanyl
- Sufenamil

The cut-off level for each drug varies depending on the type of drug and the lab conducting the test. The standard 5- panel test includes the following drugs and cut off levels:

Drug Class	Screening Cut off level	Confirmation Cut off level
Amphetamines Amphetamine, Methamphetamine & Ecstasy	500 pg/mg hair	500 pg/mg hair
Cocaine Norcocaine & Benzoylecgonine	500 pg/mg hair	500 pg/mg hair
Opiates Codeine, Morphine & 6-MAM (Heroin Metabolite)	500 pg/mg hair	500 pg/mg hair
Phencyclidine PCP	300 pg/mg hair	300 pg/mg hair
Marijuana Carboxy- THC	1 pg/mg hair	0.3 pg/mg hair

Pg/mg= picogram per milligram of hair

The following chart provides an approximate usage rate based on level reported on the lab report (source Omega Labs).

Drug	Confirm cut off	Low use (Recreational)	Medium use (weekends/daily)	High Use (constant or daily)
Amphetamines	500 pg/mg hair	500 – 2500 pg/mg hair	2500-7500pg	7500+pg
Cocaine	500 pg/mg hair	500 - 2000 pg/mg hair	2000 – 10000 pg	1 0000+pg
Opiates	500 pg/mg hair	500 - 1000 pg/mg hair	2000-8000pg	9000+pg
Phencyclidine	300 pg/mg hair	300 – 500 pg/mg hair	500-1000pg	2000+pg
Marijuana	1 pg/mg hair	0.3 pg/mg hair	Qualitative – amount does not correlate to usage	

Enzyme-immunoassay antibodies (EIA), similar to those used to test urine, are used for the initial screening test for drugs of abuse in hair; therefore the potential for substances such as over-the-counter medications to cause a false positive screening result does exist. To eliminate the possibility of reporting a false-positive due to cross-reactivity, the lab should automatically confirm by GC/MS, GC/MS/MS or LC/MS/MS all positive initial tests.

All hair samples are washed extensively to remove external contamination before screening begins. The lab tests for the metabolite of the parent drug to rule out environmental contamination or exposure. For example, to rule out the possibility of external contamination for marijuana, the labs detect only the metabolite (THC-COOH) which is only produced by the body and cannot be an environmental contaminant. If the ratio of the wash solution is greater than 10% of the confirmation result, the lab will consider this sample still contaminated. If the ratio of the wash solution is less than 10% of the confirmation result, the lab will consider the sample as positive.

A lab test is available to determine if a child has been exposed to the smoke from illegal drug use. Meaning if only the parent drug is found and no metabolites, the report will state positive for the parent drug only. This test can be used to determine if a child or infant has been exposed to illegal drug use by the parent or others. It is important not to wash the child's hair after exposure and before collecting the sample to be tested. The test will indicate the presence of the parent drug and not the metabolite proving the child is in the environment where drugs are being used.

It takes multiple uses to test positive in hair under normal drug use. A one-time use will not be above the cutoff level. A person claiming he or she used one time is not a valid claim for a positive test results in most cases. The exception may be a person on a continuous binge for several days and that person claims that as a one time use.

Extensive bleaching, perming and dyeing may damage the protein matrix of hair allowing a portion of the drug within the hair to be extracted, thus lowering the final quantitative result with certain drugs. Normal hair care using common hair products (shampoos, conditioners, sprays, mousses or gels) helps to remove external contamination and has a minor effect on removing the drug from the core of the hair.

Some shampoos designed and sold with the intent to cleanse the hair of drugs and other toxins have varying degrees of effectiveness. One product on the market will cut the level of drug in half each time it is used. The chemical in the shampoo will burn the scalp or skin after several applications preventing extensive use. A chronic user can lower the level but probably cannot eliminate the drug below the cutoff level. But a recreational user, starting with a low level, will probably be below the cutoff level resulting in a negative hair test.

In side-by-side comparison studies with urinalysis, hair drug testing has uncovered significantly more drug use. In two independent studies hair drug testing uncovered 4 to 8 times as many drug users as urinalysis. The primary reason for this difference is due to the longer window of detection for hair compared to urine. Drug users are very educated on drug testing. He or she will refrain from drug use for several days when they know a urine test is imminent resulting in a negative urine test. They will substitute or adulterate the urine sample if the collection is not witnessed resulting in a negative test. Many people will buy shampoos to cleanse the hair but still fail the test as explained previously.

NAIL TESTING

Drugs of abuse actually have been measured in nails since 1984. However, it is relatively new to the drug testing industry in the US. Several reasons can be attributed to this. One is the need for longer detection periods that nail test provides. But probably more significant was the increase number of products on the market to negate urine testing and individuals shaving their head and body to avoid a hair test or using special shampoos to remove the drug from the hair. This has brought the nail testing to the forefront as a needed and useful alternative.

Like hair, fingernails and toenails are composed of a hard protein called keratin. Drugs are incorporated into nails from the blood stream and remain locked in the nail as it grows. Nails grow in both length and thickness. Drugs enter the nail from the base (cuticle end) as the keratin is formed and via the nail bed that extends under the full length of nail.

The distal end or free end of the fingernails and toenails are clipped for testing. If length does not allow, the surface can be shaved but is not the preferred sample. If the surface is scrapped using a razor blade (a medical device) then this one procedure probably requires the collector to follow HIPAA requirements. Nail polish and acrylic nails must be removed prior to collecting the nail sample.

The method of screening for drug use in nail tests is the same as hair, Immunoassay. The nail is put in a chemical solution to remove external contaminants and then liquefied. All drugs found in the initial screen are confirmed by one of the methods previously explained.

Drugs can be identified in nail clippings 2-4 weeks following ingestion and can be detected from 3 to 8 months or longer. The broad range is based on numerous factors. Fingernails grow (approximately .12 inches per month) faster than toenails (approximately .042 inches per month), longer fingers grow faster than short fingers, age and gender of the person, the time of year, the food the person eats, the dominant hand grows faster than the other hand, etc.

There is one product on the market that purports to ensure that the drug abusing individual passes the fingernail test. It has not proven to be effective at this time.

If a person handles cocaine on a regular basis, it is possible for the person to be positive for parent cocaine. Nails are porous allowing the cocaine to absorb into the nail. It is important to remember that the nail test results will only be positive for the parent drug cocaine at a very low level and NOT the metabolites of cocaine which are norcocaine and benzoylecgonine.

If the metabolite cocaethylene (alcohol) is positive on a nail or hair test, it proves that the person consumed alcohol at the same time as the cocaine.

EtG ALCOHOL TEST - URINE

Alcohol is rapidly eliminated from the body at a rate of approximately one drink per hour. Whether looking for alcohol in breath, blood, saliva or urine, using the standard technology, the rapid elimination limits the detection of alcohol to a matter of hours.

For example an individual who was “under the influence” of alcohol using standard technologies (breath, blood or saliva > 0.8%) at 10 PM would likely test negative the next morning at 9 AM due to the rapid elimination of alcohol from the body.

After years of research, Ethyl Glucuronide (EtG) was found to be a direct metabolite of the alcohol (ethanol). EtG has emerged as the marker of choice for alcohol and due to the advances in technologies is now routinely available. Its presence in urine may be used to detect recent alcohol consumption, even after ethanol is no longer measurable using the older methods. The presence of EtG in urine is a definitive indicator that alcohol was ingested. Other types of alcohol, such as stearyl, acetyl and dodecanol, metabolizes differently and will not cause a positive result on an EtG test.

The EtG test has become known as the “80 hour test” for detecting any amount of consumed ethyl alcohol. This is not totally true. It is true that EtG can be detected in chronic drinkers for 80 hours or even up to 5 days. During this period of chronic use, the EtG level can exceed 100,000 ng/mL. Two primary factors to determine the window of detection is based on volume of alcohol consumed and the time between each drink. A person that consumes 3 drinks can only have a detectable level of EtG for approximately 20 to 24 hours and peaks at approximately 9 hours with an EtG level around 15,000 ng/mL.

Therefore, the presence of EtG in urine indicates that ethanol was ingested. EtG is a more accurate indicator of recent consumption of alcohol than measuring for the presence of ethanol itself.

EtG is stable in urine for more than 4 days at room temperature. Recent experiments indicate that heating urine to 100 degrees C actually increased the stability of EtG. Therefore, heat does not cause the breakdown of EtG, it actually increases stability. In addition, no artificial formation of EtG was found to occur following the prolonged storage of urine at room temperature fortified with 1% ethanol.

EtG is a direct metabolite of alcohol (ethanol), and its detection in urine is highly specific, similar to testing for other drugs. The typical lab utilizes the most sophisticated, sensitive, and specific equipment and technology available, LC/MS/MS, to screen, confirm, and quantitative EtG. This methodology provides highly accurate results.

Studies indicate that alcoholics in abstinence have no detectable levels of EtG in their urine after approximately 80 hours of detoxification.

EtG is only detected in urine when alcohol is consumed. This is important since it is possible to have alcohol in urine without drinking. Alcohol in urine without drinking is due to the production of ethanol in vitro. Ethanol in vitro is spontaneously produced in the bladder or the specimen container itself, due to fermentation of urine samples containing sugars (diabetes) and yeast or bacteria. Since the ethanol produced is not metabolized by the liver, EtG will not be produced and will therefore not be detected in a urine containing alcohol as a result of fermentation.

Tests show that “incidental exposure” to the chronic use of food products (vanilla extract), hygiene products, mouthwash, or OTC medications (cough syrups) can produce EtG concentrations in excess of 100 ng/mL. However, if measurable ethanol is detected (greater than .04 gm%) in the urine, and EtG is also detected in excess of 250 ng/mL, then this is very strong evidence that beverage alcohol was consumed.

Labs will allow you to select 100, 250 or 500 ng/mL as the cutoff level. It is strongly recommended that only the 500 ng/mL level be used. This avoids and eliminates any claim by the donor that the positive EtG test is a result of incidental or unintentional exposure. All testing performed on products or foods classified as incidental or unintentional exposure has never produced a positive EtG level greater than 500 ng/mL.

The benefits of an EtG urine test includes:

- Detects recent usage more accurately and for a longer period of time than standard testing
- No false positives
- No EtG found in non-drinkers
- Ideal for zero tolerance and abstinence situations
- Strong indicator of alcohol ingestion within the previous 3 to 5 days
- EtG is only evident when alcohol is consumed and is not produced as a result of fermentation
- Allows monitoring in alcohol treatment programs
- Acts as an early warning system to detect trends towards relapse

EtG ALCOHOL TEST – HAIR & NAILS

EtG alcohol testing is being performed in hair and nails. The window of detection is approximately 3 months for head or body hair and finger or toe nails. But be aware that bias does exist when comparing male and female hair. Recently an Italian study reported that bleaching the hair completely destroys EtG. Another study with water from a commercial pool was performed to determine the effects of chlorine. Hair exposed to the pool water found that two, 20 minute exposures reduced EtG by approximately 20%. It was found that this did not have any effect to alter or reduce the drug levels in nails. Based on these facts alone, it is recommended that only nails be used to test for EtG and not hair.

CONCLUSION

Now that drug testing is better understood, one unanswered question still remains. Why is a drug test negative when the donor is a known drug user? A negative drug test does not mean the donor is not a drug user, abuser or that the test is wrong. There is an explanation for the negative results. Just like a math equation, if part of the formula is missing, the correct answer is impossible to find. Same with a negative drug test of a known user. The missing parts of the formula must be gathered and analyzed to answer why the test is negative.

The donor may abstain from drug use long enough to be negative in a drug test. The donor diluted the specimen (creatinine below 20) by drinking excessive liquids such as water to get the drug level below the cutoff level. A product purchased to put in the urine can also cause a negative urine test. The donor can purchase shampoos designed to get the drug out of the head and body hair. Some of the shampoos work and some do not. The donor may be using a drug that is not included in the standard drug panel or a legal drug that cannot be detected by the labs. The list of legal drugs is getting longer and more popular. Drugs, such as Spice and K2, are sold at head shops and the internet. These products are sold as aromatherapy to side step any applicable laws but the true intent is to smoke the product to get high.

Drug testing is not as simple as it appears on the surface. The nuances and variables are many and must be understood to know exactly what a drug test means or does not mean.

APPENDIX A

NO. 09-XXXXX

IN THE MATTER OF
THE MARRIAGE OF

HUSBAND
AND
WIFE

AND IN THE INTEREST OF THE,
A MINOR CHILD

§ IN THE DISTRICT COURT
§
§
§
§ _____ JUDICIAL DISTRICT
§
§
§
§ DALLAS COUNTY, TEXAS

ORDER FOR DRUG TESTING

On this date, _____, the Court heard Respondent's motion for temporary orders.

Appearances

Petitioner, (Mother's Name) _____, has made a general appearance and has agreed to the terms of this order to the extent permitted by law, as evidenced by Petitioner's signature and the signature of Respondent's attorney, _____, below.

Respondent, (Father's Name) _____, has made a general appearance and has agreed to the terms of this order to the extent permitted by law as evidenced by Respondent's signature and the signature of and the signature of Respondent's attorney, _____, below.

Jurisdiction

The Court, after examining the record and the agreement of the parties and hearing the evidence and argument of counsel, finds that all necessary prerequisites of the law have been legally satisfied and that the Court has jurisdiction of this case and of all the parties.

Drug and Alcohol Testing of __ (Mother's Name) _____

IT IS ORDERED that (Mother's Name), shall submit to all randomly requested urine drug test, urine EtG alcohol test, nail drug test and/or hair drug test requested as provided herein below.

IT IS FURTHER ORDERED that all of the aforementioned random tests shall be facilitated by (drug testing facility name, address, phone)_____.

IT IS FURTHER ORDERED that the aforementioned random testing shall be coordinated by __ (drug testing facility name)___ and will notify (Mother's Name) ___ of the time and place of said testing as described herein. IT IS ORDERED that (Mother's Name)___ shall submit to the random testing as directed by the facilitator at (drug testing facility name)_____.

IT IS ORDERED that (Father's Name) shall be solely responsible for any and all costs associated with the aforementioned testing so long as the test is negative. In the event that (Mother's Name) tests positive for alcohol and/or drugs as described herein, (Mother's Name) shall reimburse (Father's Name) for the cost of the test(s) within 48 hours of receiving the positive test result(s). The

parties agree and IT IS ORDERED that (Mother's Name) failure to submit to testing as described herein and/or failure to appear within three (3) hours of notification for a test described herein and/or provides a diluted urine sample as determined by (drug testing facility name, address, phone) .. then it shall be treated as producing a positive test result for alcohol and/or illegal drugs.

The parties agree and IT IS ORDERED that this order serves as a release to allow the testing facility to release any and all testing results of (Mother's Name) to (Father's Name), the Court and the parties' respective attorneys

The parties agree and IT IS ORDERED that testing shall occur for the next twelve (12) months beginning the day after the date this order is signed by the court. Hair or nail tests (will/can) be conducted up to four (4) times during the twelve (12) month period. Urine tests for drugs and EtG alcohol (will/can) be conducted up to two (2) times per month during the twelve month period. The individual to be tested has three (3) hours to arrive at the testing facility upon notification of said testing.

The individual to be tested must not color, dye, bleach or use any shampoos or products on the hair that are designed to alter the results of a hair test. Head hair must remain a minimum of 1.5 inches and body hair must never be trimmed or shaved during the period of testing. Fingernails and toenails must remain a length approved by the testing facility for the purpose of nail testing. Acrylic nails are not allowed during the period of testing or must be removed prior to arriving at the testing facility for a nail test.

The individual to be tested is responsible for contacting the testing facility to provide all required information by the facility to conduct random testing in accordance with the court order. A valid photographic identification will be provided to the testing facility each time testing occurs. Current phone numbers must be provided and any changing of phone numbers provided to the facility within twenty four (24) hours.

The individual to be tested is responsible for notifying the testing facility in writing of any travel 24 hours prior to departure. The departure and return dates must be included in the written notification. If the travel is an extended period of time, the individual must take all necessary supplies to be tested while traveling. The testing facility will provide necessary supplies and locate a collection facility in the city of travel.

Supervised Possession

In the event that (Mother's Name) tests positive for alcohol or drugs or fails to comply with the terms of this order, possession of the children will revert to supervised visitation until a hearing or agreement of the parties is received.

Duration

These Temporary Orders shall continue in force until the signing of the Final Decree of Divorce or until further order of this Court.

SIGNED on

JUDGE PRESIDING

APPROVED AS TO FORM ONLY:

By: _____
Attorney for Respondent
State Bar No. _____

By: _____
Attorney for Petitioner
State Bar No. _____

APPROVED AND CONSENTED TO AS TO BOTH FORM AND SUBSTANCE:

Petitioner

Respondent